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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/965,280	09/26/2001	Takeshi Ohfuji	42390P11370	3837

7590 03/22/2005

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EXAMINER	
MOHAMEDULLA, SALEHA R	
ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 03/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/965,280	OHFUJI ET AL.	
	Examiner	Art Unit	
	Saleha R. Mohamedulla	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 November 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *37-60* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *37-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/29/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 37-60 are pending.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 37, 42-47, 49, 50, 55-58 and 60 are rejected under 35 U.S.C. 102(b) as being anticipated by US# 6,100,012 to Shi.

3. Shi teaches a photolithographic process that includes an infrared radiation post exposure bake of a chemically amplified resist layer and that improves critical dimensional control of a patterned resist layer. Shi teaches coating the chemically amplified resist onto a substrate. Regions of the resist are then selectively exposed to a first radiation to form exposed and unexposed regions of the resist. After this exposure, both the exposed and unexposed regions are irradiated with infrared radiation for a predetermined time. This irradiation employs infrared radiation of a wavenumber that is preferentially absorbed by the exposed region, in comparison to the unexposed regions of the resist. Due to the preferential absorption, these exposed regions are heated to a higher temperature than the unexposed regions. Therefore, Shi teaches a different heat flux. Finally, the resist is developed to form a patterned chemically amplified resist layer (col. 3, lines 10-30). Patterned resist layers are used to pattern underlying layers by etching processes. Because Shi teaches critical dimension control, Shi teaches undersizing and

oversizing errors and also teaches reducing an error of the exposure image. The infrared radiation selectively increases the temperature of the exposed regions while maintaining the temperature in the unexposed regions relatively low (Abstract). Therefore, Shi teaches heating the first critical dimension to a first temperature and heating the second critical dimension to a second temperature. Shi also teaches that the infrared radiation is absorbed by the functional chemical groups present in the polymer product of the acid catalyzed chemical transformation that occurs. The radiation is transformed into heat that increases the temperature of the exposed regions and thus accelerates the acid catalyzed chemical transformation in the exposed region (col. 2, lines 55-65). Therefore, Shi teaches performing position variant chemical transformation of the exposure image. Shi also teaches spin coating (col. 4, lines 14-15). Shi teaches pre-baking the substrate, that is, soft bake hot place processes, therefore, Shi teaches increasing a temperature of the applied layer by heating (col. 4, lines 15-20).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 38-41, 48, 51-54 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 6,100,012 to Shi in view of US# 6,169,274 to Kulp.

6. Shi teaches the limitations discussed above. Shi does not teach adjusting height adjustable spacers to different heights or adjusting them by turning a screw or changing a voltage input. Kulp teaches a heat treatment apparatus for wafers. Kulp teaches through holes provided at the front and back surface of a hot plate. A plurality of support pins are provided in the holes for delivery of the wafer and are inserted in a manner where the pins can appear and disappear (col. 6, lines 20-30). They are connected to a member or mechanism which can hoist and lower the pins such that the pins protrude and disappear from the surface of the holding plate. This vertical movement of hoisting or lowering allows the height of the spacers or pins to be adjusted. The mechanism can be a screw. Kulp also teaches controlling current running to the heating element (col. 7, lines 40-45). Therefore, Kulp teaches changing the voltage input.

7. The references are analogous art as they are drawn to heating the resist on wafers. It would have been obvious to one of ordinary skill in the art to include the height adjusting step of Kulp in the method of Shi in order to control the supply of heat energy to the resist on the wafer (col. 3, lines 1-5).

Response to Arguments

8. Applicant argues that Shi does not teach a heterogeneous treatment with different heat flux. However, Shi teaches that the exposed regions are heated to a higher temperature than the unexposed regions (col. 3, lines 10-30). Therefore, Shi teaches different heat flux. Applicant argues that Shi teaches infrared radiation, and not heat flux, should be applied to the resist. However, the infrared radiation causes a different heat flux as discussed in Shi. Applicant argues that Shi does not teach reducing one or more errors. However, Shi teaches controlling critical

dimension. Controlling the critical dimension so that it does not vary reduces errors caused by variations in critical dimensions. Applicant argues that Shi and Kulp are not analogous art, however, both references are drawn to heating resist layers on wafers. Therefore, the references are analogous art. Applicant argues that Kulp does not teach height adjustable spaceers. However, as discussed above, Kulp teaches height adjustment using pins or spacers during heating. Kulp also teaches the use of screws and changing voltage input (col. 7, lines 40-45). Therefore, Applicant's arguments are not persuasive.

Action is Final

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Saleha Mohamedulla whose telephone number is (571) 272-1387. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Saleha R. Mohamedulla
Patent Examiner
Technology Center 1700
March 15, 2005

MARK F. HUFF
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